

WHAT IS CLAIMED IS:

Sub a1
1. A process for the formation of an enhanced dispersed active metal (DAM) catalyst for conducting hydrogenation reactions comprising:

a) forming a slurry of particulate DAM catalyst characterized by the capacity to form more than one oxide in a suitable fluid;

b) contacting the particulate DAM catalyst in the slurry with an oxidizing agent at temperatures below 200°C for a time such that the metals no longer exhibit uncontrollable pyrophoricity, thereby forming an oxidized catalyst precursor comprising said metals and at least one of hydroxides thereof and oxides thereof, wherein at least a portion of said hydroxides and oxides are in the lower oxidation state of the metals;

c) adding to said oxidized catalyst precursor a solution in a suitable solvent of one or more reducible salts of promoter metals selected from the group of rhenium, ruthenium, palladium, iron and cobalt;

d) recovering and drying said oxidized catalyst precursor and said salt; and

e) forming an active catalyst by treating the oxidized catalyst precursor with hydrogen at elevated temperature, wherein said one or more salts will be reduced during the hydrogen treatment to form the metal.

2. A process in accordance with Claim 1, wherein the oxidized catalyst precursor is recovered and dried prior to being combined with said solution in step c).

3. A process in accordance with Claim 2, wherein said one or more salts is soluble in water and said solution in step c) is an aqueous solution.

4. A process in accordance with Claim 1, wherein the fluid forming the slurry comprises water and the oxidized catalyst precursor includes hydroxides of the dispersed active metals.

5. A process in accordance with Claim 4, wherein said one or more salts is soluble in water and steps b) and c) are carried out simultaneously.

6. A process in accordance with Claim 5, wherein said salts are nitrates.

7. A process in accordance with Claim 1, wherein step b) is carried out at a temperature below 100°C.

8. A process in accordance with Claim 1, wherein in step d) the mixture of said oxidized catalyst precursor and said one or more salts is dried in air at a temperature above 100°C for at least one hour.

9. A process in accordance with Claim 1, wherein in step d) the mixture of said oxidized catalyst precursor and said one or more salts is dried under an inert atmosphere.

10. A process in accordance with Claim 1, wherein said metal is rhenium and said salt is ammonium perrhenate.

Sub a2

" of step b) ?

11. A process in accordance with Claim 1, wherein said metal is ruthenium and said salt is ruthenium trichloride.

12. A process in accordance with Claim 1, wherein said metal is cobalt and said salt is cobalt nitrate.

13. A process in accordance with Claim 1, wherein step e) is heating said mixture in air to a temperature of about 400° for a time sufficient to form the promoter metal from said one or more reducible salts thereof.

14. An enhanced catalyst formed by the process of Claim 1.

15. An enhanced catalyst in accordance with Claim 14, wherein said promoter metal is rhenium.

16. An enhanced catalyst in accordance with Claim 14, wherein said promoter metal is ruthenium.

17. An enhanced catalyst in accordance with Claim 14, wherein said promoter metal is cobalt.

18. A process for producing higher hydrocarbons by the hydrogenation of carbon monoxide by reaction with hydrogen at reaction conditions in the presence of an enhanced catalyst according to Claim 14.

19. A process in accordance with Claim 18, wherein at least a portion of the hydrocarbons formed are upgraded to more valuable products by at least one of fractionation and conversion operations.

Sub a3

" of step b)
" of step b)